Before the
Federal Communications Commission
Washington, DC 20556

In the Matter of	)	
	)	**WT Docket No. 10-4**
Amendments of Parts 1, 22, 24, 27, 90	)	
and 95 of the Commission's Rules to	)	
Improve Wireless Coverage Through	)	
the Use of Signal Boosters	)	

Reply Comments of United States Cellular Corporation

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August 24, 2011

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Introduction and Summary

United States Cellular Corporation ("USCC") hereby files its Reply Comments in response to the Notice of Proposed Rulemaking ("NPRM")[1] and comments filed in the above-captioned proceeding. USCC reiterates its concerns about the proliferation of unlawful wireless "boosters" and "repeaters" (hereinafter collectively referred to as "boosters"), which threaten the provision of wireless service throughout the United States. We continue to believe that the FCC must adopt rules which provide that signal boosters may only be deployed with the written consent of wireless licensees.

The comments filed by wireless carriers and trade associations in this proceeding demonstrate that the rules proposed in the NPRM, which would license boosters as a "Citizens Band" type radio service, are inadequate. They ignore the fact that unauthorized boosters are illegal and fail to provide sufficient safeguards against harmful interference from booster operations. Any solution to this problem must be based on prior licensee consent to booster installation and coordination with the relevant wireless network.

[1] In the Matter of Amendments of Parts 1, 22, 24, 27, 90 and 95 of the Commission's Rules To Improve Wireless Coverage Through The Use of Signal Boosters, Notice of Proposed Rulemaking, FCC 11-53 (released April 6, 2011). ("NPRM")

And, if the FCC chooses to adopt a different approach and permits the installation and operation of any type of boosters without prior licensee consent, the FCC must preserve a mechanism to investigate claims of interference by boosters and to shut down boosters causing interference to wireless operations.

I. Booster Interference Is An Increasing Threat to Wireless Operations and Should Not Be Legitimized By The FCC

Earlier in this proceeding, USCC filed comments and reply comments[2] making the following points. If wireless carriers are to fulfill their responsibilities to the public, they must maintain control of the frequencies for which they are licensed. Wireless boosters may be, on balance, beneficial to wireless network operations, but only if booster operation is closely coordinated with and preferably controlled by the network operator. To minimize the impact which boosters will have on a wireless network, they must not only be properly designed, but properly installed. The carrier must weigh the benefit to the area where signals are being amplified against the cost of the increased "noise" which will be experienced by the "donor" sector. Neither the booster manufacturer, however reputable, nor the purchaser of the booster, can do this. Proper installation of boosters involves careful coordination with the wireless network, including the use of highly directional antennas pointed back at the "donor" sector. This reduces the size of the area and number of "sectors" the booster will negatively affect. The carrier, with foreknowledge of the booster's location, can mitigate any potential harmful interference from the booster and thus enhance its positive effects.

Carriers can also minimize interference by limiting the number of boosters in the same general area. Again, in geographically specific circumstances, carriers can weigh

[2] See Comments of United States Cellular Corporation filed February 4, 2010 ("USCC Comments"); Reply Comments of United States Cellular Corporation filed March 8, 2010 ("USCC Reply Comments").

the benefits of a small number of properly designed and installed boosters against inevitable increases in the noise floor and degradation of cell site performance. An increase in the noise floor also results in mobile devices increasing their own transmitting power to compensate, which can also have negative effects on other mobile units' transmissions. The basic point is that having too many boosters in the same area will inevitably have a negative impact on network performance, including dropped calls. If a carrier has to contend with large numbers of boosters not installed in cooperation with the carrier, operating at unknown locations in a given area, it rapidly becomes extremely difficult for the carrier to provide an acceptable level of service. And this problem is aggravated by the new models of mobile boosters, which are non-directional, and virtually impossible either to install properly or monitor.

In our 2010 Comments, USCC referred to eleven specific instances of severe booster interference to its operations and our Reply Comments called attention to the evidence of similarly destructive interference provided by CTIA, Verizon Wireless and AT&T.[3] The instances of interference cited are only the tip of a massive and growing iceberg. Wilson Electronics, Inc., a booster manufacturer, in its recent comments on the NPRM, estimates that there are more than 1,000,000 "unregistered signal boosters in use today."[4]

Lastly, while we noted that the FCC has commendably taken action to shut down individual boosters causing interference to the operations of USCC and other wireless carriers, that it had not taken meaningful general action against unlawful wireless boosters. We urged that the Commission do so either through a Declaratory Ruling under

[3] See USCC Comments, pp. 5-7; USCC Reply Comments, pp. 2-3.
[4] Comments of Wilson Electronics, Inc. in Docket 10-4, filed July 25, 2011, ("Wilson Comments"), p. 9.

current law or by means of a rulemaking proceeding if the FCC considered that necessary or desirable. The FCC released the NPRM in April 2011.

II. The Remedies Proposed In The NPRM Are Not Adequate

USCC acknowledges that the NPRM reflects a good faith attempt by the FCC to deal with an interactable problem. However, for the reasons to be given below, we do not believe its proposals will be adequate to solve the problem.

In general, for both fixed and mobile "consumer" signal boosters, the FCC is proposing the following new requirements. The FCC proposes the creation of new "Citizen Band" type radio service under Part 95 to cover boosters:

1. Such "consumer" boosters would have to comply with the technical parameters (e.g. power and unwanted emission limits) for the applicable spectrum band and with the RF exposure requirements for the type of device the booster is (i.e. fixed or mobile);
2. Consumer boosters must automatically "self monitor" their operations and shut down if not in compliance with the FCC's technical rules;
3. Consumer boosters must be marketed and labeled in a way which provides consumers with clear information concerning the lawful use of the devices;
4. Upon notification, boosters must immediately cease operation in the event they cause harmful interference to wireless network operations;
5. Booster owners must coordinate their frequency selection and power levels with the applicable wireless carrier or carriers prior to operation.[5]

[5] NPRM, ¶5.

Mobile signal boosters would also be required to power down, or shut down completely, automatically when the device was not needed, such as when the device came close to the base station with which it was communicating.[6]

The FCC also sought comment on whether to require boosters to be "registered" with a national signal booster "clearinghouse" prior to operation and also sought to facilitate the near term availability of boosters which comply with the new rules by requiring that within 30 days of the effective date of the rules that all applications for equipment authorization for signal boosters demonstrate compliance with the new rules and by requiring that within six months of the effective date that all boosters marketed or sold in the United States comply with the new rules.[7]

The FCC's proposal has been respectfully but sharply criticized in comments filed by CTIA, T-Mobile, a coalition of wireless carriers represented by Blooston, Mordkofsky, Dickens, & Prendergast, and the Wireless Communications Association International.[8] Their comments have points of similarity and some differences, but they together point to serious weaknesses in the FCC's proposed system of booster regulation.

CTIA reiterates its position that licensee consent must be required to operate a signal booster and that the FCC must clarify that the sale of boosters to unauthorized parties is illegal under current law. CTIA opposes the FCC's attempt to create a new "CB radio" type booster radio service under Part 95 of the Rules, stressing that unauthorized

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[6] NPRM, ¶¶53-54.
[7] NPRM, ¶65, ¶43
[8] Comments of CTIA-The Wireless Association in CG Docket 10-4, filed ("CTIA Comments"); Comments of T-Mobile USA, Inc., In CG Docket No. 10-4, filed July 25, 2011 ("T-Mobile Comments); Comments of Licensees Represented By Blooston, Mordkofsky, Dickens, Duffy & Prendergast in CG Docket No. 10-4, filed July 25, Licensees, 2011 ("Blooston Licensee Comments"). Comments of Wireless Communications Association International in CG Docket No. 10-4, filed July 25, 2011 ("WCAI Comments").

booster operation is also illegal under the Communications Act, and thus cannot be turned into a lawful service by FCC action.[9]

CTIA argues that any technical and design standards adopted for signal boosters by the FCC must completely mitigate harmful interference. The essential requirement is that signal boosters must be designed so that the wireless licensee on whose network a booster is operated has ultimate control over the device. In addition, signal boosters must transmit only on the frequencies authorized for use by the wireless provider whose signal is being boosted, rather than across a range of frequencies. Boosters must also be designed with "automatic gain control," to allow "powering down" as the booster approaches any wireless base stations. Fixed boosters should have chipsets that provide signal location, remote shut-off control, and a mechanism for relaying E-911 information. Mobile boosters should also be required to have a remote shutoff function, operate on a channelized or narrowband basis, contain oscillation detection with automatic shutdown, contain components that manage the device's power based on and proximity to the base station and feature a mechanism for relaying accurate E-911 location information. Like other wireless devices, signal boosters should be subject to an equipment certification process and should be designed with next generation networks in mind, particularly LTE and Wi-Max.[10]

CTIA believes, and we agree, that the FCC must continue to take action against harmful interference caused by unauthorized use of the signal boosters, though CTIA does encourage collaborative efforts to find a compromise solution with respect to

[9] CTIA Comments, ¶¶12-14.
[10] Ibid, pp. 14-18.

booster deployment.[11] USCC concurs, but would stress the need for continuing FCC action against interference no matter what standards are adopted.

T-Mobile also argues that the FCC should not create a new CB type service which would authorize the deployment of signal boosters and rightly maintains that the creation of such a secondary service on wireless frequencies would be unlawful. Instead, signal boosters should be permitted only pursuant to the authorization of the "host" carrier. According to T-Mobile, this approach would be consistent with treatment of other consumer devices such as handsets and would be consistent with prior FCC precedent.[12]

If, however, the FCC determines that consumer use of signal boosters offered by third parties would serve the public interest, T-Mobile urges the following "minimum steps" be taken to ensure the equipment does not cause harmful interference. First, consumers must be required to register signal boosters with the host carrier before deployment. Second, signal boosters should be required to use interference prevention technologies such as automatic gain control and oscillation detection. Third, signal boosters must be designed to allow the incumbent licensee to shut down or modify the operating parameters of interfering boosters. Fourth, licensees must have the right to prohibit the use of signal boosters in certain environments. T-Mobile also urges the creation of a national "clearinghouse" to oversee the signal booster registration process.[13] USCC agrees with these proposals.

The Blooston Licensees maintain that signal booster devices should be treated as subscriber equipment, much like handsets and air cards, so that the wireless carriers can ensure these devices only operate on frequencies utilized and in locations authorized by

[11] Ibid, pp. 18-19.
[12] T-Mobile Comments, pp. 1-6.
[13] T-Mobile Comments, pp. 8-14.

the subscriber's carrier.[14] We agree that they should not be licensed independently. The Blooston Licensees also rightly note that there is a need for booster signal technology in both rural and urban settings to overcome coverage gaps. However, they note that wideband signal boosters are prone to cause harmful interference owing to the so-called "near/far problem." The Blooston Licensees also emphasize the potential for disruption of E911 location finding services and argue this alone constitutes an argument for the strongest possible measures against unauthorized boosters.[15] This is an important point.

Accordingly, the Blooston Licensees also argue the FCC should not authorize signal boosters in a Citizen Band type radio service. On the contrary, they support a system whereby individual boosters would be "certified" and would have to operate in accordance with an individual carrier's license. Wireless carriers would have to be able to locate the booster at all times and if necessary, disable the signal booster if it were causing harmful interference and did not automatically shut down. Lastly, the Commission must prohibit and take enforcement action against the manufacture, importation, sale or distribution of non-compliant signal boosters. And present unauthorized signal boosters should not be "grandfathered" and should be shut down by the FCC.[16] As noted above, it may be impractical to shut down the million or more unauthorized boosters now in operation throughout the country. However, in our view, that is all the more reason to be vigilant against continuing interference, no matter what certification procedures or rules are adopted.

WCAI argues strongly that current law prohibits the use of signal boosters without licensee consent and that to permit such use would be bad policy as well. WCAI

[14] Blooston Licensee Comments, p. 1.
[15] Ibid, pp. 2-8.
[16] Ibid, pp. 8-11.

argues that the use of signal boosters without licensee consent is substantially different from the current Citizens' Band radio services and that Part 95 of the Rules cannot be interpreted to encompass the use of mobile or fixed wireless boosters. [17] Moreover, as a policy matter, licensees should always be responsible for compliance with the rules of the FCC, since licensees have the strongest possible incentive, i.e. fear of loss of their licenses, to comply with the Commission's rules and also have strong economic incentives to avoid harmful interference to other licensees. Manufacturers and retailers of signal boosters however, lack similar incentives to comply with the Commission's rules. Thus, WCAI argues that it is not surprising that manufacturers and retailers of signal boosters have sometimes disregarded the law while marketing their products.[18]

Accordingly, a "rule" framework regarding booster operations applying to manufacturers and retailers is not likely to promote compliance with the rules. Nor will a consumer focused approach be likely to produce satisfactory results, owing to a lack of consumer awareness of the rules.[19] USCC agrees with the logic of those arguments.

Thus, the rules proposed by the FCC to solve the interference problems, such as self monitoring, will likely prove insufficient to adequately protect networks and consumers from the negative effects of signal boosters. Accordingly, WCAI urges the FCC to abandon the proposed rules.[20] However, if the FCC does adopt rules to regulate signal boosters, WCAI urges the FCC should implement stringent technical safeguards. The most important of those safeguards is that the devices be subject to a multi-step certification process, similar to what T-Mobile recommends, involving type certification

[17] WCAI Comments, pp. 1-4.
[18] Ibid, pp. 4-6.
[19] Ibid, pp. 6-7.
[20] Ibid, pp. 12-16.

and additional review measures to verify that the devices will be capable of operating without causing harm to wireless networks. Once the carrier has authorized the activation of the device prior to its usage, the carrier must be able to identify, locate and shut off the device if that is deemed necessary. Furthermore, the transmit power of the booster must be controlled either by the licensee or by the device through the use of gain control functionality. Also, a booster's transmissions must be limited to the frequencies which are licensed to the authorized carrier and there must be mechanisms available for insuring that these requirements are followed and enforced.[21]

Underlying all these comments by wireless carriers and their trade associations is a skepticism about the ability of any system of rules to regulate boosters and prevent interference. That skepticism has been reinforced by the comments of Smart Booster, a manufacturer of "smart" boosters.[22]

Smart Booster manufactures "intelligent" signal boosters. Such boosters incorporate an "updateable" memory, GPS, and a microprocessor which acts on the memory and GPS capabilities. They are now allegedly available in prototype form.[23] Smart Booster argues that only such "intelligent" boosters are capable of accomplishing the tasks for boosters set forth in the NPRM. Smart Booster, Inc., argues that the "unintelligent" boosters manufactured by Wilson Electronics and other manufacturers have fundamental flaws. Ordinary boosters may turn themselves off in proximity to the "wrong" base station or turn themselves on in too close proximity to the "right" base station and overwhelm the base station receiver. Or ordinary boosters may fail to

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[21] Ibid, pp. 17-20.
[22] Comments of Smart Booster, Inc. in CG Docket No. 10-4 filed, July 25, 2011 ("Smart Booster Comments").
[23] Smart Booster Comments, p. 5.

accurately detect the intensity of the downlink signal from the base station, causing malfunctions. Or a booster operating where it is not needed may cause an unnecessary increase in handset power.[24]

Smart Booster opposes licensing "unintelligent" boosters by rule for the following reasons. Licensing by rule strips carriers of their spectrum stewardship, which has long proven itself to be the most effective incentive for minimizing interference and maximizing the efficient utilization of spectrum. Signal boosters are not stand alone transmitters or transceivers and therefore do not acquire new and complicated transceiver rules. Licensing by rule will confuse consumers who are not accustomed to maintaining wireless appliances that must comply with a license. Licensing by rule also makes future network changes difficult if not impossible, because there will be no mechanism for recalling older yet operational boosters that impede these changes. Instead, what is needed, according to Smart Booster, is an intelligent signal booster that can automatically limit its operations to comply with the needs of specific carriers. USCC obviously takes no position on Smart Booster's claims regarding its own product, but believes its criticisms of any rule-based system of regulating existing boosters are valuable and significant.

[24] Ibid, pp. 11-13.

III. USCC Is Skeptical Concerning the VZW-Wilson Proposal and Believes The FCC Should Retain Authority To Shut Down Any Booster Causing Interference

USCC understands it is likely the FCC will focus its attention on the proposal by Verizon Wireless and Wilson Electronics to create a new framework for possible booster rules.[25] Wilson and VZW propose three types of boosters to be regulated in different ways.

"Consumer Boosters" may be installed by consumers for use in buildings or vehicles. Their specifications are technology neutral and provide protection to all CMRS network technologies, including the cellular, PCS, and AWS bands. Consumer Boosters must be FCC type certified to meet the specifications in the joint proposal and must be bi-directional RF amplifiers. Consumer Boosters must be registered with the licensed carriers, either manually or through a Bluetooth connection to the device. Consumer Boosters must not exceed 1 watt uplink composite power per band of operation and 1.5 watt downlink composite power per band of operation and must meet certain requirements for antenna gain, emission limits, automatic gain control, AGC, wideband signal design, and anti-oscillation protection, and in band noise and base station (BTS) limits.

The second type of booster would be industry certified, engineered and operated (CEO) boosters. CEO regulations would apply to any booster not meeting the Consumer Booster specifications and requirements or not installed by the licensee. CEO Boosters would also have to be bi-directional RF amplifiers whose standards would be developed by industry participants, including trade associations, manufacturers, installers and

[25] See letter from John T. Scott, III, Andre Lachance and Russell Lukas to Marlene Dortch, WT Docket No. 10-4 (July 25, 2011) ("Joint Letter").

licensed carriers. CEO Booster systems may support individual and multiple wireless carriers. CEO Boosters would have to be installed and engineered by installers certified by an industry organization, according to standards set by the stakeholders. CEO Booster installation would have to be coordinated, as necessary, by the installer and records of the installation would have to be maintained in a database by the installer. Because CEO Booster installation and operations would be coordinated with licensees, they would operate under the licensees' authority, eliminating the need for individual licensing. Operators of CEO Boosters and would provide the licensee with 24 hour contact information so the booster would be turned off in cases of interference. CEO Boosters will require acceptable completion of on site testing.

The last type of booster would be Licensee Installed Boosters, which would operate on licensee's frequency band and would not be subject to the requirements of consumer booster or CEO Boosters.

USCC is not necessarily opposed to this proposal, though we are concerned about aspects of it, chiefly the system for regulating "consumer boosters" and the standards approving "installers" of "CEO" boosters.

To put it simply, USCC does not believe that the FCC type acceptance or certification processes or the process by which "installers" are approved can work sufficiently well as to obviate the need for continuing vigilance against interference. Whether or not a "Consumer" booster has been certified in accordance with the FCC's Rules or a CEO booster has been installed by a qualified installer, if they cause interference, they have to be shut down.[26]

[26] USCC acknowledges that the Verizon Wireless/Wilson proposal provides for "shutting down" interfering Consumer boosters, through the "registration" process and "Bluetooth" connections. See "Consumer

In the past, USCC has been able to rely on FCC Field Offices to shut down interfering boosters. If the suggested new rules were to be interpreted to mean that "lawful" Consumer and CEO boosters would have a free pass to cause interference without recourse, that state of affairs would be worse than the current system, chaotic and unsatisfactory as it is. If this proposal is adopted, it should be clarified to ensure that carriers will also be protected from interference caused by "Consumer" and CEO boosters, either by the carrier being able to shut off the booster remotely, if and when the necessary technology becomes available, or through the existing process of FCC enforcement.

Conclusion

USCC asks the FCC to act to preserve wireless service by preserving the FCC's right to act against interference by wireless signal boosters. Any Commission decision to adopt the Verizon Wireless/Wilson Electronics proposal or any other compromise proposal should consider the prevention of interference to wireless carriers and their customers to be a paramount objective.

Respectively submitted,

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Booster Specifications For CMRS Spectrum Bands," attached to Joint Letter and provided by VComm, pp. 7-8. However, we remain skeptical about the development of technology to implement these requirements, which does not now exist, and strongly believe that the option of FCC enforcement must be retained.